AN OVERVIEW OF STEELHEAD
Status and Management In Idaho

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Trout Management

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INTRODUCTION

Idaho's tributaries of the Snake River produce approximately 55 percent of the Columbia Basin's summer steelhead. Adult summer steelhead are behaviorally adapted to long distance riverine migration (450-1,000 miles) to spawning and juvenile rearing streams in Idaho. Summer-fall migration is interrupted by overwintering in the main stem Columbia and Snake rivers as well as major tributaries such as the Clearwater River, Salmon River, and Grande Ronde River, Oregon. With spring runoff, summer steelhead proceed to the headwater tributaries for spawning April through June.

The juvenile rearing cycle includes two to three-year tributary stream rearing for wild fish and one-year rearing for hatchery fish. Smolts leave Idaho with spring run-off from mountain snow melt from late April through June. During ocean rearing, Idaho stocks range broadly and are harvested by ocean and coastal fisheries primarily north of the Columbia River. On their return they provide major components of Columbia River sport and tribal commercial and subsistence fisheries.

Summer steelhead are very important to people of Idaho. Snake River salmon stocks have declined to critical levels. Idaho sport fisheries for salmon are restricted to a very limited directed fisheries on hatchery stocks. Wild steelhead numbers are also low and apparently in decline. Wild steelhead are protected from harvest in Idaho; traditional major tributary fisheries are prohibited. While these important traditional fisheries have been lost, hatchery produced steelhead abundance has grown to levels supporting substantial fishing opportunity. Record run sizes and fisheries for hatchery fish occurred in 1985-86 and 1989-90 fish-run years. The average Idaho sport fishery during 1985-89 involved approximately 30,000 anglers, 196,300 angler days of effort, 80,900 steelhead caught, and 36,300 hatchery steelhead harvested. Anglers expend an average of 58 percent of their effort and catch 55 percent of the steelhead during the fall season, October through December.

The character of our steelhead resource is extremely variable. Naturally produced stocks are at a depressed level while hatchery stocks range annually between record high and low numbers. Annual fishery opportunity and effort fluctuates widely with hatchery run size.

STOCK STATUS

Idaho's summer steelhead are broadly grouped into two categories for Columbia River regional management. Group A adults migrate up the Columbia passing Bonneville Dam generally between July 1 and August 25. The majority of the fish are one-ocean reared and destined for streams throughout the Columbia Basin above Bonneville. In Idaho A-steelhead originate in the Snake River, Salmon River, and small tributaries of the lower Clearwater River.

Group B steelhead migrate past Bonneville primarily after August 25 and before November 1. These steelhead are large, two-ocean rearing fish destined for Idaho's Clearwater and Salmon rivers tributaries. The size at age difference between A and B steelhead is great enough that a stock separation technique based on length is being explored to improve Columbia River harvest management procedures.

Historical production of steelhead in Idaho came from a Snake River basin range involving 16,000 miles of stream. In the early 1960's over 100,000 wild steelhead returned to the Snake River. Approximately 65,000 of these fish were destined for the Salmon and Clearwater rivers.

Major habitat alterations began in the late 1950's and 1960's with development of the main stem Snake and Columbia river's hydroelectric generation system. The Idaho Power Company Hells Canyon project blocked adult migration and created a reservoir environment unnavigable by migrating smolts. Production area was reduced to 6,400 miles by this project. The A-group mid-Snake River steelhead production area was severely impacted. As mitigation, a series of hatcheries were developed to perpetuate mid-Snake steelhead returns to the Hells Canyon region and relocate these runs to the Salmon River system.

Following the Idaho Power project, the federal Lower Snake River four-dam hydroelectric generation system was completed to complement the four main stem Columbia dams below the mouth of the Snake River. Juvenile and adult migration survival rates declined precipitously. A series of mitigation hatcheries were constructed to increase production to compensate for the increased mortality rate and to maintain fishable steelhead populations in Idaho.

Finally, Dworshak Dam was constructed on the North Fork Clearwater River, blocking that river to B-run steelhead. Mitigation was to be provided by the Dworshak National Fish Hatchery. Endemic North Fork B's were trapped as brood stock to produce annual returns of adults to the North Fork and other tributaries of the Clearwater.

Steelhead response to these environmental impacts was immediate declines of wild fish. In 1974-75 only 3,000 wild steelhead returned to Idaho spawning tributaries. The total adult run size at Ice Harbor Dam was only 12,200 steelhead. A combination of commercial and sport fishery closures and restrictive harvest regulations, hydroelectric system turbine screening and bypass provisions for smolts, truck and barge smolt transport operations, and a wet hydrologic cycle proved favorable. Hatchery production began to play **a** major role in production. Hatchery and wild fish populations increased (Figure 1).

Following the mid-1980's factors occurred which began influencing Snake River steelhead abundance. Snake River hydrologic conditions entered a prolonged drought cycle, and coupled with increasing hydroelectric generation demand in the region, Snake River discharge was vastly reduced. Smolt migration mortality elevated at the hydroelectric projects and major adult losses occurred during Snake River

immigration. At the same time, commercial gill net fisheries by Tribal fishermen increased replacing the non-Tribal Lower Columbia River commercial fishing which had been curtailed since 1975.

Overall, stock productivity declined. Wild fish escapement declined precipitously (Figure 2). Hatchery steelhead run sizes fell to very low numbers some years followed by record numbers in others, depending largely on migration flow conditions. Ratios of wild fish to hatchery fish widened, increasing mixed stock commercial fisheries implications and probabilities for overharvesting wild stocks. Genetic concerns have elevated due to the imbalance.

Currently, naturally produced steelhead are well below the interim guidelines of the Columbia River Management Plan (CRMP) which calls for 20,000 wild A-run and 10,000 wild B-run fish. Rebuilding progress is questionable and the successive A-run abundance decline is alarming. Juvenile abundance indicators range between 9-90 percent of the estimated carrying capacity of available stream habitat. Most are well below 50 percent. Production from the low 1990 spawning escapement will not be parr until 1991-1992.

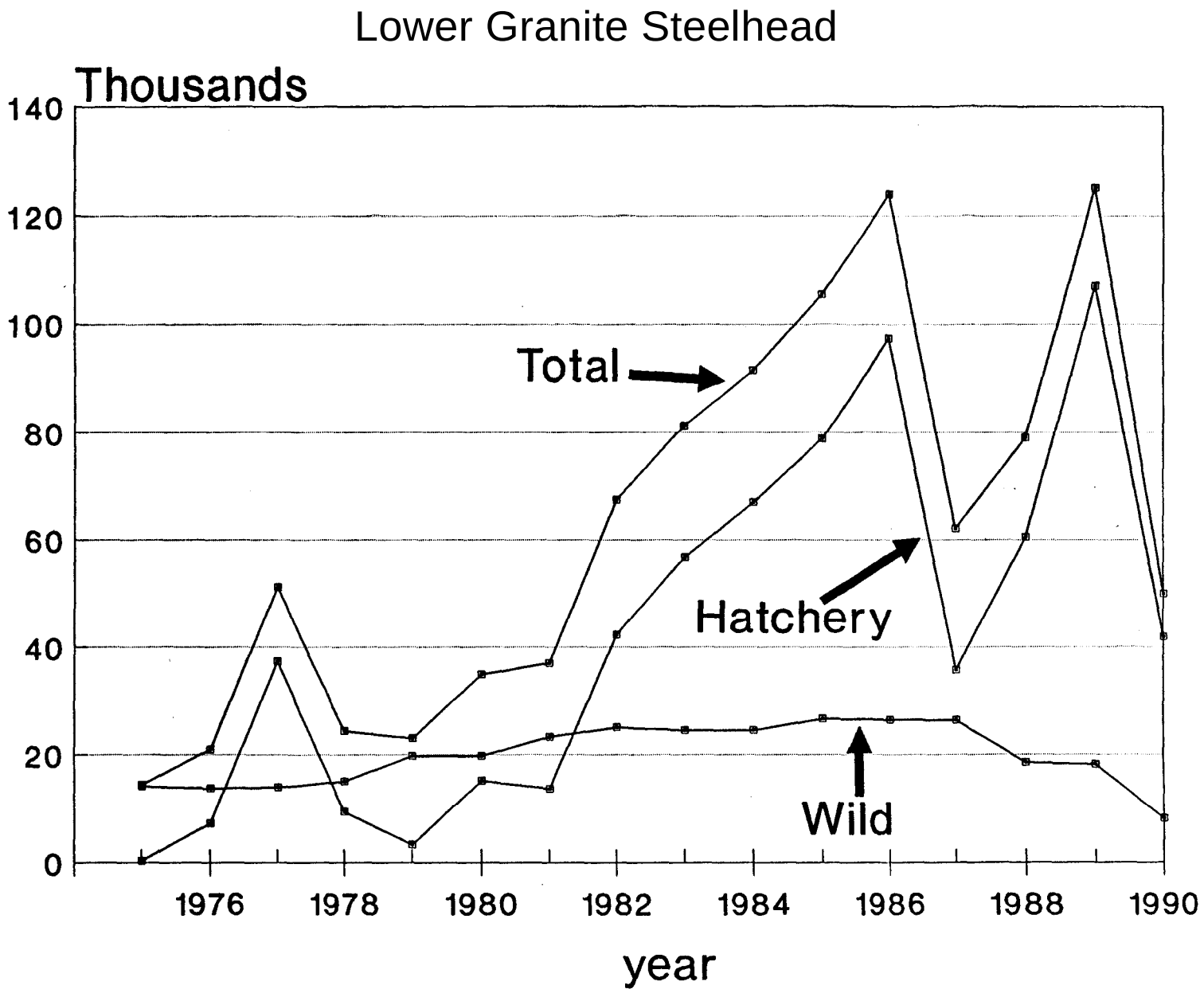


Figure 1. Hatchery and wild fish populations

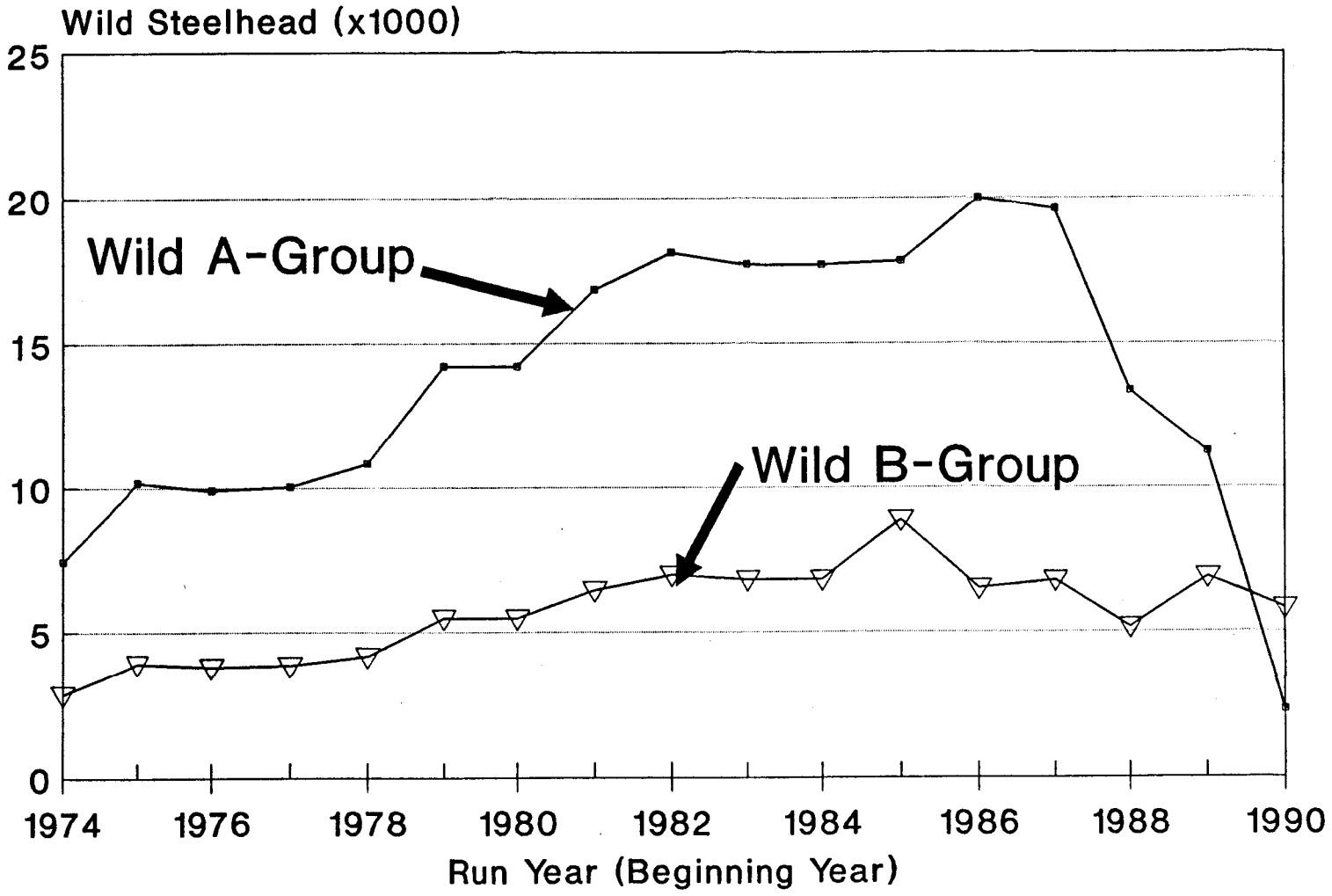


Figure 2. Wild fish escapement

MANAGEMENT AND RESEARCH

The Department's management program since the decline of the mid-1970's has focused on maintaining and recovering wild populations to harvestable levels and achieving adult returns of hatchery fish expected of each mitigation program. Actual accomplishment of these goals has been hampered by poor fish survival and failure of wild fish to rebuild to optimum levels. Much of our recent effort is directed at identifying and resolving the major survival limitations related to harvest and production.

Harvest

Idaho fisheries are for sport and tribal ceremonial and subsistence anglers. Sport harvest and most tribal fishing is for hatchery fish. Low wild fish abundance precludes sport harvest of those fish. All hatchery steelhead produced in Idaho are identified by excision of the adipose fin of juveniles prior to release. Catch-and-release regulations are in effect statewide for non-adipose clipped wild fish. Anglers may fish only with barbless hooks in wild fish migration corridors. Trap and haul of hatchery surplus adults for fisheries in urban areas near Boise, beyond the current spawning range for steelhead, are not regulated with barbless hook requirements. Fall fishing is a major activity in the lower main stem areas of the Snake, Clearwater, and Salmon rivers. Spring fishing shifts to the various hatchery and upstream tributary terminal locations. Wild fish tributaries are closed at all times.

Release of hatchery stocks are managed to distribute fall arriving, overwintering and spring terminal concentrations of fish so that all local fisheries have opportunities for harvest, and so that anglers can spread to as much area as possible. Releases are made directly from hatchery weirs and outplanted considerable distances away from hatcheries. Harvest rates of 60 to 80 percent of the various hatchery releases are achieved.

Fisheries are monitored by field personnel for in-season fishery monitoring, coded wire tag detection and collection, and law enforcement. Statewide telephone surveys of both fall season and spring season anglers are conducted after each season to estimate harvest and effort by fishing area. A permit (punch card) is required of anglers as an enforcement aid and to remind anglers of when and where they caught steelhead.

Columbia River Fisheries

Snake River steelhead contribute to Columbia River sport and commercial fisheries. Of concern to Idaho is the take of wild fish. Sport fisheries are regulated by adipose clip harvest regulations. Non-tribal commercial harvest of steelhead by gill nets is not permitted. However, some incidental impact occurs during the commercial seasons (August through October) for fall chinook and coho

salmon. Movement of summer steelhead, particularly B-group fish up the Columbia coincides with these two species. Area, time and mesh size regulations minimize steelhead catch.

Tribal commercial gill net fisheries target on steelhead as well as fall chinook in traditional fishing areas above Bonneville Dam. The CRMP allows harvest rates of up to 15 percent of the wild A-group and 32 percent of the wild B-group crossing Bonneville Dam regardless of run size. Thus harvest rates of these magnitudes are allowable under the CRMP even on severely underescaped runs. Hatchery steelhead are harvested under 50:50 sharing principles but wild steelhead impacts usually constrain harvest rates of hatchery steelhead in the fall fishery. Other tribal fisheries (commercial and subsistence) occur in the winter and in terminal areas.

Ocean Fisheries

Snake River summer steelhead also contribute to various ocean fisheries. Coded wire tagged (CWT) hatchery steelhead have been encountered in many coastal and ocean commercial and sport fisheries (Table 1). Quantification of this data has not been attempted. It is likely that steelhead detection in salmon fisheries is limited by inconsistent marking and recovery programs. Pacific Salmon Treaty discussions have noted these likelihoods, and further pointed out that steelhead are often included as salmon with catches of small salmon species. In addition, inconsistent CWT release group sizes and frequency likely hamper ocean fishery evaluation.

High Seas Drift Gill-Net Fisheries

Expansion of high seas driftnet fisheries in the North Pacific has raised the concerns of Idaho along with the rest of the Pacific Northwest. Early indications were that Idaho steelhead were distributed in the fishing zones targeted by the flying squid fishery and likely comprised a portion of the salmon and steelhead taken. While quantifications of harvest are unavailable, the State of Idaho joined with others to oppose this activity and ask for moratorium on all high seas drift net fishing.

Our primary concerns are the indiscriminate take of critical wild steelhead stocks and lack of reported quantification of take of all fish and other animals necessary for effective management and conservation of these species. Responsible management requires that we understand the role this fishery plays in Snake River steelhead productivity. Idaho remains concerned about this activity and supportive of all efforts to monitor and regulate this fishery to prevent adverse effects.

Table 1. Fisheries occurrences of Idaho summer steelhead in fisheries beyond the Snake River system as indicated by coded wire tag recoveries.

Fishery	Type
Southeast Alaska	Coast Net/Seine
	Coast Sport
British Columbia	North Coast Net
	Johnstone St. Troll
	Johnstone St. Net
	Southwest Troll
Washington	St. Juan de fuca Net
	Coastal Sport
Oregon	North Coast Sport
High Seas	Gill Net - Japan
	Exper. - Japan
Columbia River	Sport
	Tribal Commercial
	Tribal Cere/Subs

Production

Steelhead production is driven by optimizing hatchery production for angler harvest and rebuilding natural production to optimum levels of escapement. Natural production includes populations with history of hatchery outplanting (supplementation) which recruit by natural production (natural stocks) and endemic populations which have no history of hatchery supplementation or a limited amount unlikely to have genetic implications and which recruit by natural production (wild stocks).

Hatchery stock production dominates our program and provides for angler expectations and fishing. Spawning escapement goals largely have been met, but harvest goals often have been held below expectations to ensure that hatchery needs were met.

Low productivity of wild fish has not resulted in expected rebuilding. Juvenile seeding levels are well below optimum for the potential of rearing habitat. Adult numbers passing Lower Granite Dam are declining.

Supplementation of natural stocks with hatchery fish has not yielded results and rebuilding. Extensive outplanting with fry, smolts, and adults in the South Fork Clearwater River between 1961 and 1989 has resulted in little improvement in natural production. Poor contribution of supplemented populations is most likely caused by the

same low smolt-to-adult survival that affects wild fish. Given that survival bottleneck, rebuilding through supplementation or other production mechanisms is doubtful.

Fisheries geneticists, managers and user groups have elevated concerns for anadromous fish genetics and the potential for management practices to degrade long-term stock productivity by changing inheritable traits. Continued imbalance of low wild and natural stock abundance and high hatchery stock returns, fish outplanting and supplementation activities, and the complexity of juvenile transport operations work sympatrically against genetic management.

Idaho's program direction is expected to become more conservative in response to genetic issues. Snake River steelhead and salmon survival is expected to be poor over the next few years due to current Snake River Basin drought conditions. We expect little improvement in wild and natural stock productivity and continued variation in brood year production of hatchery stocks. Our program will focus more intently on management of stock components as isolated and interbreeding units. Hatchery stocks will be managed to provide optimal harvest benefits and to maintain or improve inherent stock viability and long-term productivity. Wild stock management will continue to maintain genetic isolation and preserve the genetic uniqueness of those populations. Natural stock supplementation will become more conservative. Donor populations at levels sufficiently high to provide gametes without jeopardizing their status are scarce. Incorporation of these into hatchery production for supplementation will be implemented with research oversight. Conservation hatchery strategies and guidelines will be developed and assessed.

Public Perception and Satisfaction

Sustained low wild and natural stock abundance and variable hatchery stock abundance has created a difficult public satisfaction climate. Expectations for wild and natural stock rebuilding and resumed fishing in major tributary systems were optimistic following 1977. Mitigation programs and hatchery construction raised expectations for abundant fish runs. Implementation of main stem hydroelectric system turbine screening and bypass, and barge transportation further elevated expectations. Idaho sport and tribal fishermen are becoming very impatient with continued restrictions on wild and natural steelhead fishing. Annual boom and bust harvest seasons and bag limit regulations for hatchery runs are frustrating. The overall result is low user satisfaction. Perceptions of management ineptness follow at least by some.

Altering these problems is largely a matter of informing the public. Public explanation and information are difficult to disseminate because of limited public communication resources. Specific stock information, particularly needed to clearly explain the steelhead problem pertaining to wild stock migration behavior and abundance, is largely lacking.

Management/Research

Idaho's research program for steelhead is management oriented to support critical juvenile migration decisions, evaluate and monitor stock status, and develop supplementation strategies. Research is supported by mitigation funding contracts directed at evaluating and crediting contributions of mitigation actions. Research effort, therefore, focuses primarily on harvest and spawning escapement returns and smolt production numbers. Pure research is limited by lack of funds.

Available funding is further hampered by the low priority of steelhead relative to salmon. Funding for the fish and wildlife programs of the Northwest Power Planning Council authorized by the Northwest Power Act is a major funding source for Columbia Basin anadromous fish. Funds are competitive and support programs of 18 Indian tribes, four states and three federal agencies. Funds are distributed to projects based on numerous criteria. Steelhead are not a priority species for funding support. Similar priority is assessed for Pacific Salmon Treaty funding.

Juvenile Migration:

– Ed Buettner	Monitoring arrival and travel time through Lower Granite Pool	PIT, CWT Water Budget Scoop/Dipp Map
– Russ Kieffer	Migration behavior, travel time and survival of natural production	PIT, Snorkeling Juvenile weir operations

Stock Status

– Russ Kiefer	Parr/smolt survival and abundance and spawner-smolt relationships	PIT, snorkel transects, weir operation
– Dick Scully/ C. Petrosky	Parr abundance/habitat relationships and trends	Snorkel transects
– Peter Hassemer/ Kent Ball	Steelhead stock separation by fork length measurements	Harvest management Escapement measure
– Kent Ball/ Dave Cannamela	Mitigation hatchery production contribution/management	Harvest monitoring Brood year survival, release group survival, Lower Snake River Compensation Plan, Idaho Power Company

HATCHERY PROGRAM

The Idaho hatchery program for steelhead began in 1956 as a mitigation action for loss of major production areas and elevated juvenile and adult mitigation mortality accompanying hydroelectric dam construction and operation. Since 1980 smolt releases have increased from 4.8 to 8.1 million (Figure 3).

Three mitigation programs fund the hatchery steelhead programs in Idaho: Idaho Power Company mitigation for fish losses caused by the Hells Canyon Dam projects which effectively denied access to approximately one-third of Idaho spawning grounds and smolt rearing area; U.S. Army Corps of Engineers mitigation for the construction of Dworshak Dam which denied access of fish to the North Fork of the Clearwater River; and the Lower Snake dams mitigation known as the Lower Snake River Compensation Plan, which is to mitigate fish losses caused by the four Lower Snake River federal dams and navigation locks.

Facilities and Status:

Idaho has six existing steelhead hatcheries and one under construction. Idaho Power Company owns and funds Oxbow, Pahsimeroi, and Niagara Springs hatcheries with mitigation goals of returning 200,000 pounds of steelhead smolts to the Snake River at Hells Canyon, and 200,000 pounds of steelhead smolts to the Upper Salmon River. Oxbow Hatchery, operating since 1961, and Pahsimeroi Hatchery, operating since 1969, are utilized for adult trapping and spawning. They have the pond capacity to hold 7,000 adult steelhead and egg incubation capacity of 8,500,000 eyed eggs. Niagara Springs Hatchery is a one-year smolt rearing facility capable of rearing 1,900,000 smolts or 400,000 pounds to approximately 4.5 fish per pound and was put into operation in 1966.

The U.S. Army Corps of Engineers built and funds Dworshak National Fish Hatchery which began operation in 1969. This facility has the adult holding capacity of 3,000 adult steelhead, incubation capacity of 10,000,000, and the rearing capacity of 2,300,000 steelhead smolts at 5 to 6 fish per pound. The project goal is to produce enough smolts to return 20,000 adults to the Clearwater River.

The Lower Snake Compensation Plan has contract funding through the U.S. Fish and Wildlife Service and provides mitigation through Sawtooth, Magic Valley and Hagerman National fish hatcheries. Clearwater Fish Hatchery is under construction and should be on line in the spring of 1992. Sawtooth Hatchery began operation in 1985 and is used along with Sawtooth's satellite to trap and spawn steelhead adults and has the adult holding capacity of 3,500 adults and incubation capacity of 5,0000,000 eyed eggs. It is used to supply the eggs to both Hagerman National Hatchery and Magic Valley Hatchery. Hagerman began operation in 1984 and utilizes a one-year rearing cycle to produce up to 340,000 pounds of smolts or approximately 1,749,000 smolts at 4 to 5 fish per pound. The mitigation goal is to return 13,400 adult steelhead to the Snake River basin. Magic Valley Hatchery began operation in 1987 and is designed to rear 349,800 pounds of smolts or approximately 2,100,000 smolts at 4 to 5 fish per pound in a one-year rearing cycle. The project goal is to

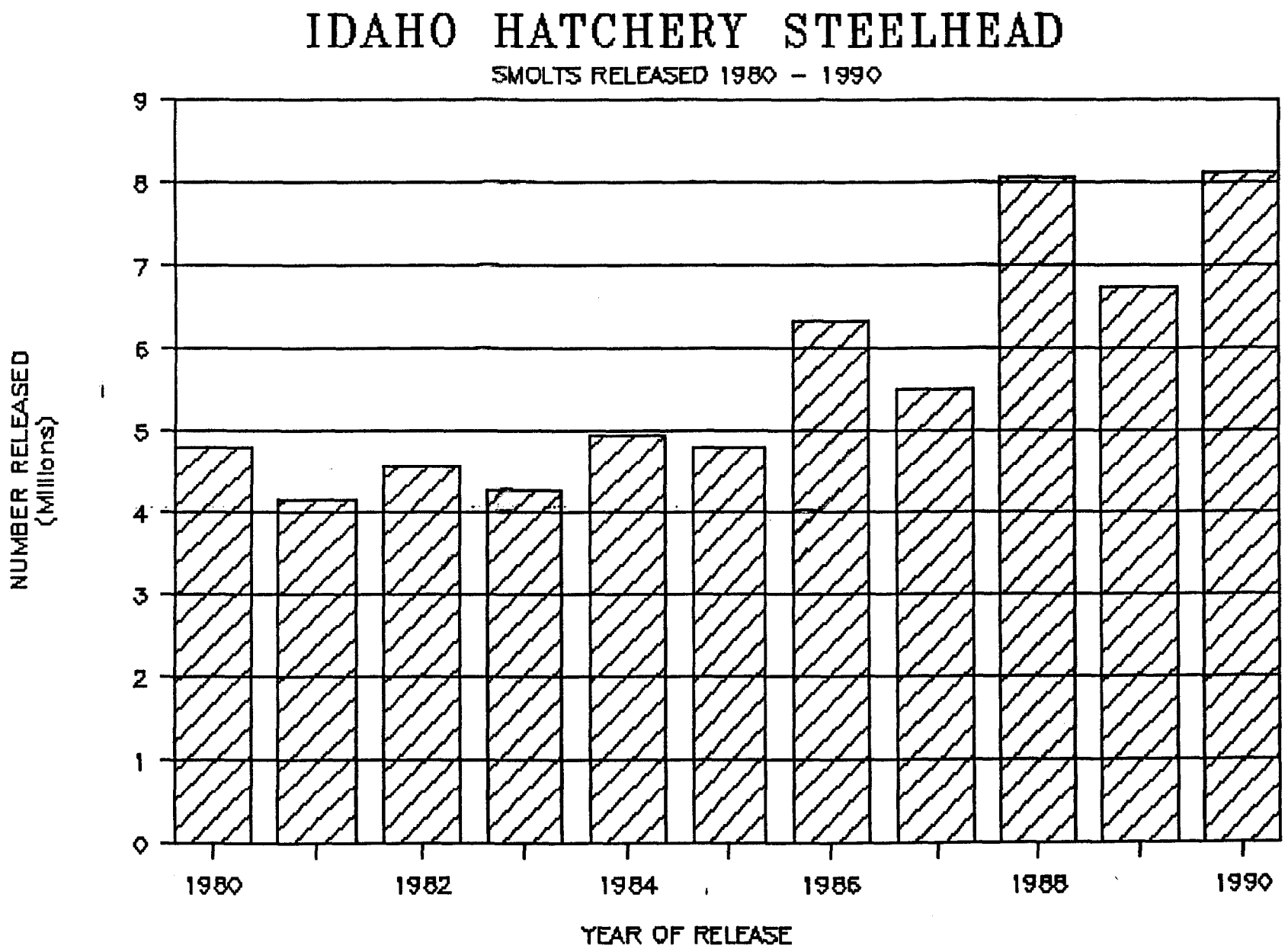


Figure 3. Smolt releases

return 11,600 adult steelhead back to the Snake River basin above Lower Granite Dam. Clearwater Hatchery is being constructed with the rearing capacity of approximately 1,750,000 steelhead smolts at 5 fish per pound or 350,000 pounds of smolts. The goal for Clearwater Hatchery is to return 14,000 adult steelhead to the Snake River basin.

A total of 8.1 million smolts were released by these programs in 1990 (Table 2). The various mitigation production goals were met.

Table 2. Production of summer steelhead smolts at hatcheries in Idaho, 1990.

Hatchery	No. planted	Lbs planted	Percent goal
Magic Valley	2,122,900	486,750	139
Niagara Springs	1,903,300	465,400	116
Hagerman National	1,439,300	339,520	100
Dworshak National	2,663,600	400,106	107
Total	8,129,100		

Survival of smolts varies considerably by year and hatchery. In general, smolt to adult survival including Idaho harvest ranges between 0.8 and 2.5 percent.

Hatchery Management Issues

Hatchery-related diseases present a formidable challenge. Viral infections, most notably Infectious Hematopoietic Necrosis (IHN), have caused catastrophic mortality in young steelhead at some of the hatcheries in Idaho. In turn, management brood selection and release strategies have been constrained to prevent outbreaks of disease in hatcheries and spread of disease to other hatcheries and drainages producing steelhead. Intensive culling of potential carrier stock has potentially reduced the severity of disease outbreaks but requires more brood fish. Work on procuring disease-free water sources for existing and new stations promises additional protection.

Management of hatcheries has focused on providing large numbers of smolts to enable sufficient adult returns to perpetuate hatchery production, provide harvest opportunity, and produce fish for supplementation. Idaho hatchery operations have successfully provided for perpetuation and harvest. While doing so, some inadvertent, but major stock changes occurred. At Pahsimeroi Hatchery, for example, run timing and spawning dates were shifted. From 1969 through 1973, 17 percent of the steelhead run was trapped by March 31 and one-half of the fish spawned after May 1. In 1989 and 1990, 67 percent of the steelhead were trapped by March 31 and no fish spawned after May 1. This phenomenon is attributed to keeping early arriving adult eggs to meet production goals, and by the non-intentional selection process of poor feed quality resulting in small smolt size from later eggs, and poor survival of those smolts. Achieving

full production at the facility was met but at the expense of losing one month of harvest opportunity since these fish now leave the fishing area one month earlier.

This behavioral change selected against late spawning fish used for natural run establishment or supplementation of existing natural populations.

We are currently involved in reassessing the objectives of our hatcheries. Some will be managed as traditional production for harvest stations. Brood stock will be managed for isolated populations breeding within themselves for specific traits. Primarily these traits will be measures of maintained stock productivity and maximized returns to target fisheries (timing distribution and catchability). Uncertainties exist as to how to maintain stock productivity over the long term. At present, most facilities utilize one male spawned with one female. Brood stock is drawn from the entire run across time.

Other hatcheries will be managed specifically to provide the best supplementation product. Natural brood will be mined from existing populations in tributaries. Their progeny will be handled as near naturally as possible to minimize "domestic" influence. Rearing will be as short as possible and at low density. Measures of success will be external to the hatchery--how well do they return to spawning streams, produce progeny, and those progeny return. Many questions exist relative to the concept of a "conservation hatchery."

HABITAT AND NATURAL PRODUCTION

Idaho's habitat protection and improvement program involves a broad spectrum of land and water management entities. The majority of the watershed system of the Salmon, Clearwater, and Snake river subbasins that produce Idaho steelhead is administered by the federal government (72 percent US Forest Service, 10 percent US Bureau of Land Management). The remainder is private (16 percent), tribal (1 percent Nez Perce Tribe), or state administered (3 percent). A variety of land and water management regulations and programs exist which can affect the quality of riparian habitat and water quality for steelhead production. Approximately 6,400 miles of streams currently are available for natural production of steelhead. Much of this habitat is excellent or good quality (29 and 28 percent, respectively). Some is fair (29 percent) and 14 percent is categorized as poor. Much of the fair and poor habitat is not degraded, but by its nature not suited for steelhead production.

Degraded habitat exists as a result of various land and water uses. Mining, logging, irrigated agriculture, and livestock operations are all historic and prominent activities. Improving riparian habitat for anadromous fish has been an activity of historic and current fish, land, and water managers.

In years following the 1974-75 steelhead declines, specific instream habitat improvement, and migration barrier alteration projects were implemented as authorized by the Northwest Power Act (1980) and the NWPPC's Fish and Wildlife Program. The Department initiated a program in

1984 to monitor juvenile production and mitigation benefits to the Bonneville Power Administration resulting from these funded projects. The program assesses yearling and older parr abundance by snorkeling standard transects. Physical and chemical habitat features are measured and likewise tracked. From this monitoring, an understanding of relationships of juvenile production, habitat capacity and spawning escapement is evolving.

Habitat-Production

Potential production of parr and smolt steelhead for all steelhead streams has been classified according to habitat quality (Table 3). If all habitat was fully seeded to its potential, approximately 4.5 million smolts could be produced each year under current habitat conditions. Habitat improvement would increase potential only by 10 percent.

Table 3. Carrying capacity ofsteelhead parr and smolts estimated for habitat of different qualities in Idaho.

	Number per 100 m^2	
Quality	smolts	parr
Excellent	10	20
Good	7	14
Fair	5	10
Poor	3	6

At the present time, steelhead production streams are underseeded. In 1985-89 wild A-run steelhead parr averaged 70-80 percent of the habitat capacity, wild B-run averaged 10 percent, natural (hatchery supplemented history) A-run 10-80 percent, and natural B-run 10-40 percent. A-run steelhead habitat comprises approximately 48 percent of the parr/smolt production potential (including Oregon and Washington tributaries) yet received 70 percent of the adult spawning during this period. The 1990 decline in A-run escapement should result in reduced parr abundance.

Underseeding is principally a function of low wild adult spawning escapement. Information from Idaho parr monitoring, Washington Department of Wildlife research and parr monitoring in Oregon Department of Fish and Wildlife redd count index streams support the parr and adult spawner relationship, particularly at the lower seeding levels in Idaho.

Main Stem Habitat-Survival

Low adult returns are related to elevated mortality of Idaho-produced steelhead primarily since construction of the main stem Snake and Columbia rivers hydroelectric projects. Survival of smolts to returning adults declined precipitously from 1964 to 1974, but then began improving. Improvement is attributed to a series of wet years which

provided ample runoff and velocities through the pool behind Lower Granite Dam and to initiation and development of a juvenile collection and transportation program at Lower Granite and Little Goose dams. Although transportation has benefited steelhead smolt survival (Figure 4), good flow conditions are necessary to get smolts through the first project reservoir to transport facilities and optimize survival (Figure 5).

Survival of adults during their upstream Columbia River migration is also influenced by hydroelectric system operations and discharge of the Snake River. Flows less than 35,000 cfs in the Snake River during September result in poor survival of B-run adults leaving the Columbia River. A minimum daily average flow of 35,000 cfs and a minimum instantaneous flow of 30,000 cfs is necessary for optimum survival.

Management-Research

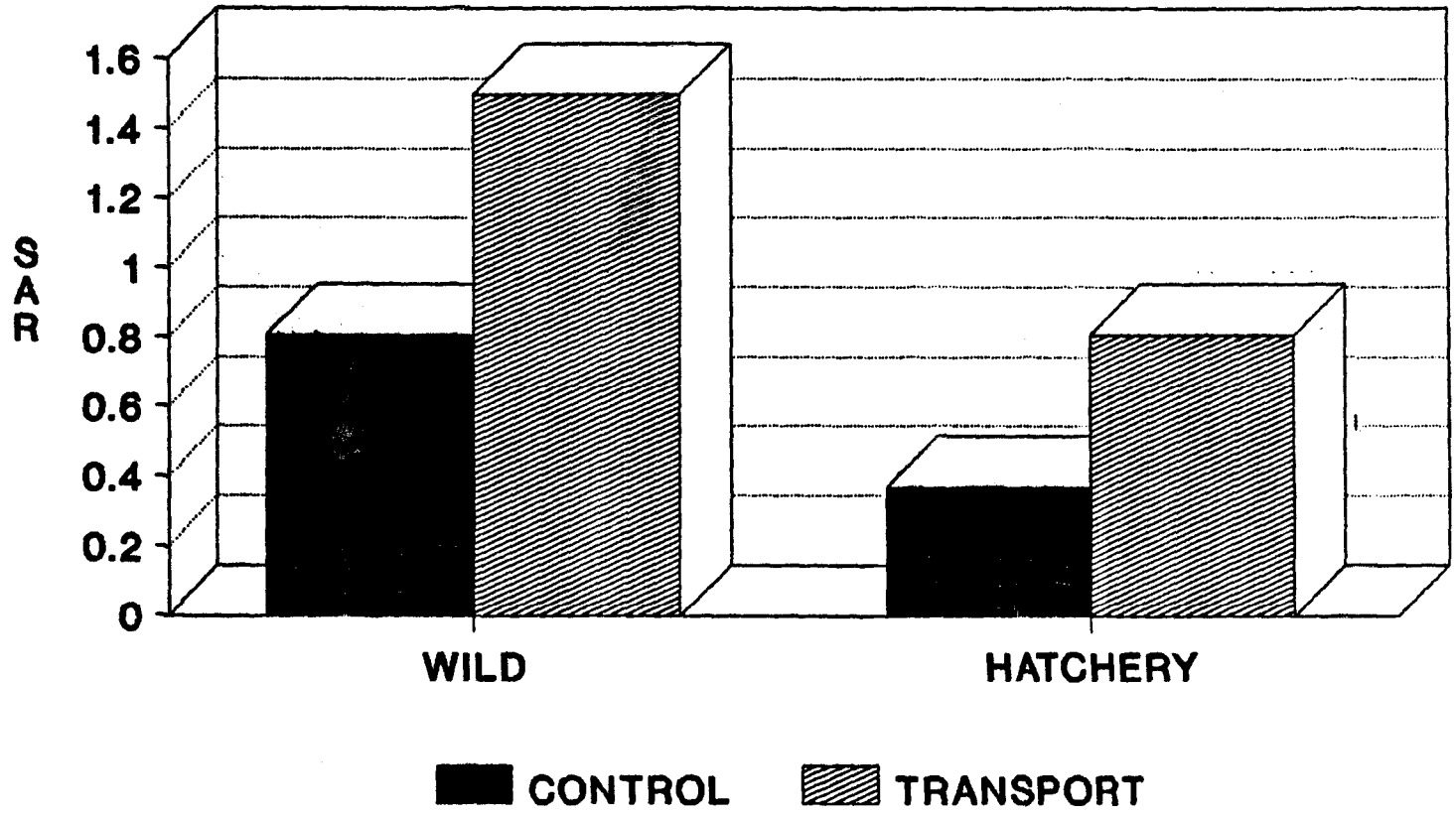
Priorities for the Department's habitat program are to obtain suitable main stem velocity conditions of migration habitat for juvenile and adult steelhead and maintain and improve transportation operations for juveniles to reduce and stabilize survival. Reduced mortality is a prerequisite for success of habitat restoration activities in Idaho spawning and rearing streams. Seeding levels of all habitats, regardless of quality, are low for most populations. Improving spawning and rearing habitat quality or quantity is unlikely to increase juvenile production as long as survival remains bottlenecked during migration and returns of wild adults remain low. Some exceptions exist, such as the South Fork Salmon River. This river system is degraded by fine sediment from historic logging and road building. Fine sediment limits egg-smolt survival. Improving habitat quality would likely result in some increased production from existing adult returns.

In terms of habitat enhancement activity, our management priority of attention and potential for benefits is:

1) Improving and stabilizing juvenile and adult migration habitat conditions (water volumes/velocity) and subsequent survival;
2) Supporting implementation and enforcement of existing state and federal water quality standards and regulations;
3) Completing irrigation water withdrawal screening projects and securing perpetual minimum instream flows for migration and rearing; and
4) Restoring critical habitat that limits early life history survival (egg-parr) of existing wild populations.

Research and monitoring activities underway or needed are directed toward improving management in Idaho and affecting management decisions beyond Idaho that influence returns of steelhead to our state:

1) Monitoring of adult spawning stock in tributaries and juvenile production. This information is needed to strengthen the parr-adult relationship and adult-smolt early life history understanding and refine escapement objectives;



Matthews et al. 1990

Figure 4. Transportation of smolts

STEELHEAD RETURNS VS. FLOW
1977-84 SARs FROM LOWER GRANITE
Raymond (1988)

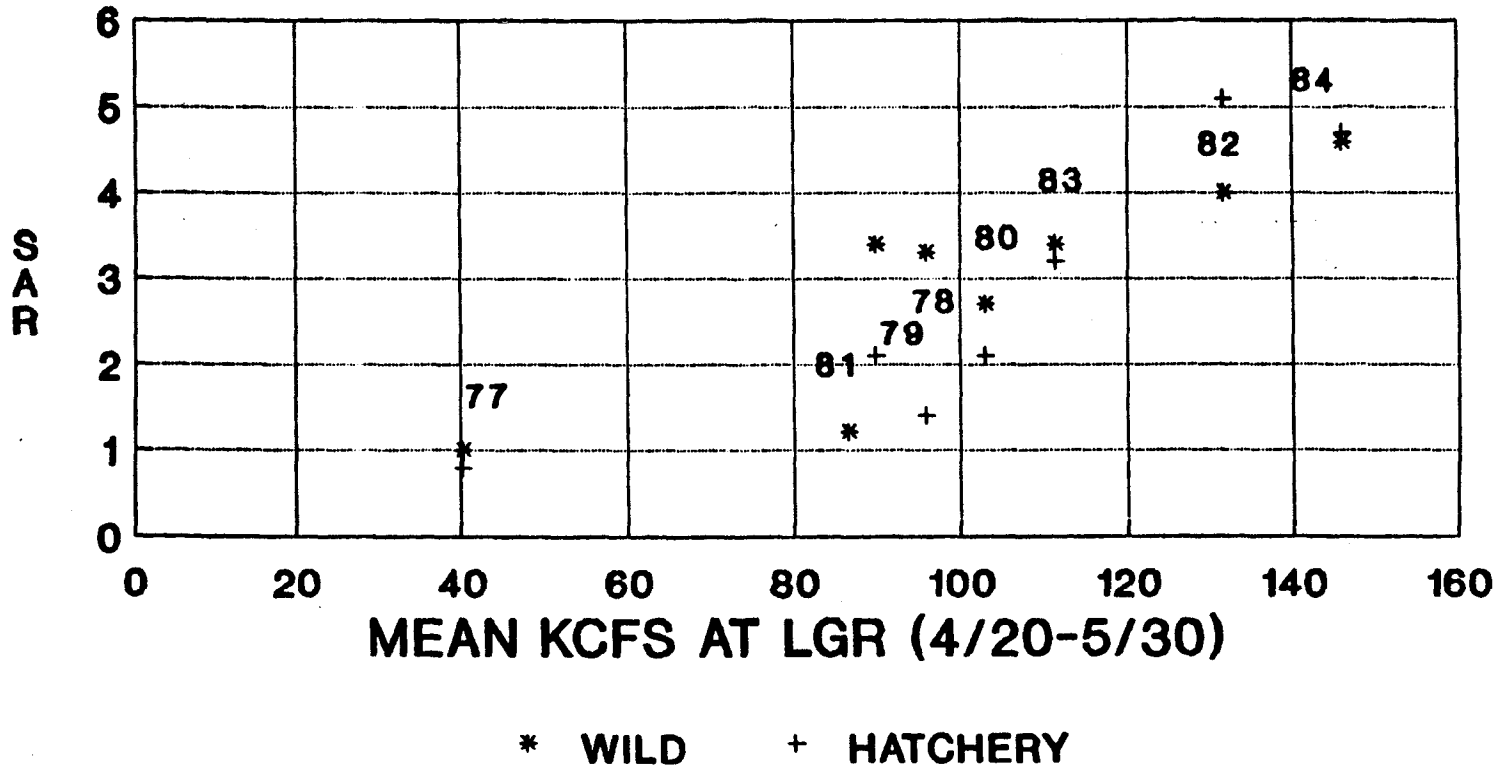


Figure 5. Flow conditions

2) Evaluation of habitat quality influence on egg-smolt survival and carrying capacity. This is needed to support land and water management decisions and harvest management processes relative to spawning escapement needs;

3) Understanding of population age and size composition useful for stock identification. This information is needed to tune steelhead management to a stock basis rather than run basis;

4) Monitoring genetic criteria needed to guide decisions relative to wild fish policy and management; and

5) Evaluation of supplementation effectiveness. Needed to assess whether supplementation of natural populations with fish reared for same period in a hatchery can be used to rebuild natural populations. A myriad of brood stock, hatchery rearing practices, outplanting strategies, and genetics questions exist.